

DEVELOPMENT OF APPLICATION SHOWCASE FOR “WATERSHED PRIORITIZATION (SWaP)”

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ABSTRACT:

Watershed prioritization is one of the important aspect in watershed management. Implementation of watershed development programme in the entire watershed, at a time, may not be possible due to lack of resources, including financial resources. So, the watersheds need to be prioritized for taking up the developmental activity, based on the severity of the problems in the watershed. There are various criteria for prioritizing the watersheds based on its physical and socio-economic characteristics. Ministry of Rural Development, Govt. of India, is responsible for providing the policy guidelines for watershed development, has emphasized different criterion to prioritize the watersheds for taking up under watershed development programme in the country. This study has concentrated by taking one of the criteria i.e. socio-economic characteristics for prioritizing the watersheds towards soil and water conservation in an automated way. The authors have developed a package called ‘SWaP’ for the purpose. SWaP stands for Showcase for Watershed Prioritization. SWaP is a menu driven shell for watershed prioritization developed using a Macro Language of COTS GIS package. It generates watershed priority map in an automated way using minimum of one or maximum of six parameters. The parameters considered in this model are percent SC/ST, percent wasteland, percent forest land, drainage density, percent slope and drinking water facility. All input coverages are required in NNRMS standards developed by Dept. of Space, Govt. of India. As per this model, each and every parameter is weighted and normalized with respect to minimum and maximum values in the watershed area. Then, the ranks are assigned to the categories within each parameter depending upon its significance related to development. The weightage and ranks multiplied to get index for individual parameters. Watershed priority index (WPI) is then calculated by summing up the values of all parameters indices. Finally, the WPI is divided into four classes of priority based on mean and standard deviation to get watershed priority map.

1.0 INTRODUCTION

Watershed management refers to the process of formulating and implementing a course of action involving development of natural resources (both land and water) and human resources of a watershed to provide resources that are needed and suitable to the community, within the limits of ecological carrying capacity of the watershed. Therefore, the developmental activities should not adversely affect the soil, water and the environment. Watershed management must consider the social, economic and institutional factors operating within and outside the watershed. It essentially means that one needs to have comprehensive development of a watershed so as to make productive use of all its natural resources and also protect them. However, it is difficult to take the development activity in all the watersheds of the catchment. Thus, there is a need to prioritize the watersheds based on either i) Sediment yield estimation, ii) Run-off estimation or iii) Socio-economic indicators. In this study an attempt has been made to develop an automated tool to prioritize the watersheds based on socio-economic indicators and the criteria provided by Ministry of Rural

Development, Govt. of India (Guideline for Watershed Development) and are as follows.

- Watershed should have preponderance of wasteland/common lands
- It should have acute shortage of drinking water
- It should have large population of SC/ST
- In the watershed area, the actual wages should be significantly lower than the minimum wages.
- Watershed should be contiguous to another watershed, which has already been developed.
- Watersheds identified under previous programmes for development shall not be taken up again.
- Watershed should have a minimum area of about 500 ha.
- Watershed should fall normally within the village boundary.

Keeping in view of the above criteria, the application showcase has been developed to prioritize the watersheds. This application showcase has been developed using macro language.

2.0 DATA USED

In all six parameters considered for watershed prioritization. However SWaP shell runs on minimum of one or maximum of six parameters. All coverages and tables are required to be in NRIS standards. All data base are used generated under IMSD/NRIS project (Pathan S K et al., 1998). List of database required is given in **table-1**.

Table-1 List of parameters

3.0 FUNCTIONALITIES:

SWaP provides following functionalities;

- Generation of watershed priority map based on weightage and indexing method in an automated way
- Querying on watershed priority map.
- Area statistics on watershed priority map.
- Automatic map composition (for hard copy).

All above functionalities can be accesses through menus and buttons provided by GUI of the shell (**Figure-1**)

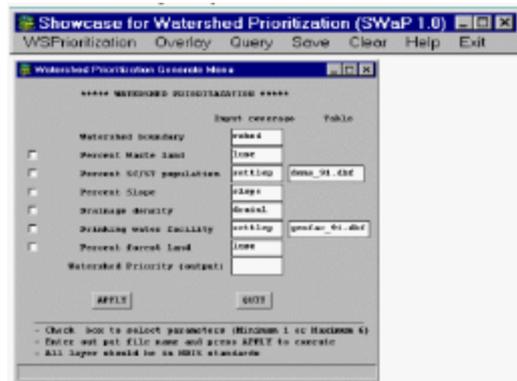


Figure-1 GUI

To generate watershed priority map select WSPrioritisation menu option then Generate option and provide parameters by checking the box against each parameters. User can check the box for one or more than one parameters as per requirements as shell runs on minimum on one or maximum 6 parameters. User can change layer as well as table names in place of default name provided by the shell. Enter out put file name and press **APPLY** button to execute the watershed prioritization. At the end of the execution,

watershed priority map will be displayed automatically. Press **QUIT** button to exit from Watershed Prioritization Generate Menu and return to the Main menu.

4.0 METHODOLOGY

The shell will intersect watershed boundary with each selected parameters and calculate the watershed priority parameter values. Parameters used are listed in table-1. In the present shell six (1 to 6) parameters has been used to derive priority of the watershed. A suitable methodology has been developed to prioritize the watersheds for development in Dahod taluka of Panchmahals district, Gujarat employing both RS and GIS techniques (Bhanderi R J and Pathan S K, 1999). Same methodology has been adopted to develop watershed prioritization shell (**Figure-2**). In this methodology, each and every parameter is weighted and normalized with respect to minimum and maximum values in study area. Then ranks are assigned to the categories within the parameters depending upon its significance related to the watershed priority as given in the criteria **table-2**.

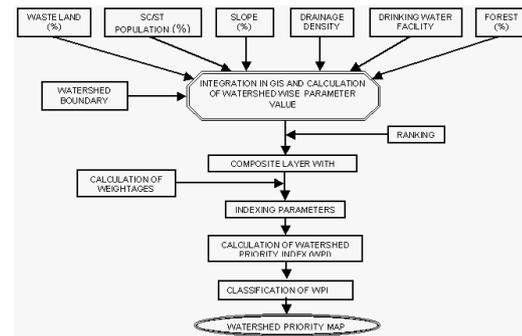


Figure-2 Methodology

Table-2 Criteria

The weightage and ranks are multiplied to get an index for individual parameters. Then, the total index called Watershed Priority Index (WPI) is calculated by summing up the values of all parameters index. Finally, the WPI has been divided into four classes based on mean and standard deviation values. These four classes of watershed priority are categorized from High to very low.

5.0 ADVANTAGES

- It is totally a menu driven package for the generation of watershed development priority.

- Operation of shell is very simple.
- User requires minimum interaction with the shell because it asks only for the input database selection and to enter out put file name.
- SWaP shell generates watershed priority map automatically.

6.0 ADHERENCE

The shell is compatible to NRIS/NNRMS standards for all required input thematic coverages. Therefore, when the package is activated, if the coverage is not in NRIS/NNRMS standards i.e. it does not contain required code-items then it will be terminated with error message “ An error has occur...”.

7.0 ROBUSTNESS

The package is versatile to Window 2000 and NT based system with ARC/INFO GIS software. It has also a compatibility with the number of parameters to be used for the generation of watershed development priority. It means the program can work for minimum for one or maximum for six parameters. It is totally a menu driven package.

8.0 RESULTS

Watershed Priority Map has been generated for Dahod taluka in Panchmahal district and Panchmahals district in Gujarat state It has taken only 5 to 10 minutes to generate the watershed priority map in an automated way and display it. However, the time period depends on the number of polygons, number of coverages used and the area of the taluka or district. A watershed priority map generated using SWaP shell is presented in **figure-3**.

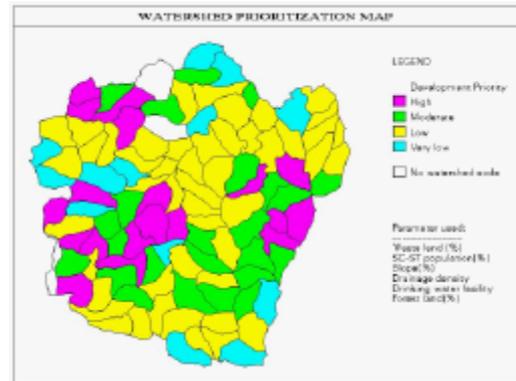


Figure-3 Watershed Priority Map

9.0 REFERENCES

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